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QST Compares Dual-Band FM Hand-Held Transceivers
(Alinco DJ-G5TH; ICOM IC-T7A; ICOM IC-W32A; Standard C508A; Yaesu FT-50R)

Product Review

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QST Compares: Dual-Band FM Hand-Held Transceivers

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After 30 years of explosive growth, FM is now the most popular mode in Amateur Radio today. Tens of thousands of repeaters populate the countryside, most of them on 2 meters and 70 cm. That accounts for the strong popularity of dual-band FM transceivers. Although 2 meters is still the most popular FM band, 70-cm is a close second, particularly in urban areas.

Thanks to advancements in miniaturization (such as surface-mount technology), hand-held transceivers (H-Ts) have become the radios of choice for many FM enthusiasts. These little rigs offer many of the same features as their larger base or mobile cousins, but at sizes and prices that are more appealing—especially for hams on the go who like to take a radio along on trips.

In addition to their Amateur Radio applications, H-Ts also see extensive use as monitoring receivers. Hams use the extended receive coverage and sophisticated scanning functions to eavesdrop on aircraft, police, fire, and many other services. In fact, out-of-band receive is considered a "must-have" feature these days by many hams. All of the H-Ts in our review group offer extended VHF and UHF coverage outside the amateur bands—including the AM aircraft frequencies on VHF. A couple of them receive up into the 900-MHz range, but ARRL Lab tests showed the IF image rejection was a negative number in both cases at 902 MHz! Don't let that throw you, though. This does not indicate a problem with the receiver. The filters in these receivers have been optimized for 2 meters and 70 cm. When "opened up" for expanded receive coverage, it is not uncommon for some combinations to result in an image response that is a little stronger than the on-channel, desired signal. In other words, it's an outcome of the design trade offs that give wide-band reception as a desirable extra.

With increasing sophistication, however, comes increasing complexity. The way in which an H-T handles the task of programming its multitudinous functions is

Table 1
Dual-Band H-T Features

	Alinco DJ-G5TH	ICOM IC-T7A	ICOM IC-W32A	Standard C508A	Yaesu FT-50R
Expanded VHF/UHF reception	Y	Y	Y	Y	Y
Aviation band reception (AM)	Y	Y	Y	Y	Y
Regular memory channels	80/100 per band	60	100 per band	60	100
Memory cloning	Y	N	Y	N	Y
Memory names	N	N	Y	N	Y
PC programmable	N	O	O	N	O
Programmed scan	Y	Y	Y	Y	Y
Power-output choices	Y	Y	Y	N	Y
Low-battery indicator	N	Y	Y	N	Y
Lighted buttons	Y	N	Y	N	N
Automatic repeater offset	N	Y	Y	N	Y
Paging (code or tone squelch)	Y	Y	Y	N	O**
Priority channel monitoring	Y	N	Y	Y	Y
DTMF autodialer	Y	Y	Y	N	Y
CTCSS encoder	Y	Y	Y	Y	Y
CTCSS decoder	Y	Y	Y	N	O**
Antenna connector type	BNC	BNC	BNC	SMA	SMA
Suggested retail price	$429	$359	$479	$345	$380
Typical selling price (as of 5/97)*	$382	$303	$407	$287	$347**

Key
Y = Standard
O = Optional
N = None or not available

*Typical selling prices represent an average of prices quoted by several dealers who advertise in *QST*. They do not include rebates, coupons or specials that manufacturers may offer.
**Yaesu now offers only the FT-50RD model which provides CTCSS decode and paging options, as well as a digital voice recorder.

often a measure of its quality. This doesn't mean that you can ignore the operating manual and expect the radio to work as you desire, but some H-Ts are clearly easier to comprehend than others (and so are some of the manuals that come with them!). Because ease of use is the number-one concern of most H-T buyers, we paid particular attention to this aspect in our review. Nearly all of our reviewers suggested that manufacturers keep it simple, simple, simple! The consensus was that they'd rather have an H-T that's easy to use and program than one loaded with features they don't need.

We gathered five of the more recent dual-band H-Ts that have appeared on the market since our last comparison review of dual-band H-Ts. In our review, we'll take a look at the Alinco DJ-G5TH; two units from ICOM, the IC-T7A and the IC-W32A; the tiny Standard C508A; and the Yaesu FT-50R. Each of these units got a thorough ARRL Laboratory evaluation. Then, we distributed the H-Ts to a review team consisting of: Rick Lindquist, N1RL; Jean Wolfgang, WB3IOS; Larry Wolfgang, WR1B; Kate Cook, N1ODI; Martin Cook, N1FOC; Peter Budnik, KB1HY; and Paul Danzer, N1II. They used the radios in typical operation, then submitted their comments for incorporation in this review.

Our users' comments sounded some common refrains that probably apply not just to this group of H-Ts but to H-Ts in general. As reviewers have in past H-T reviews, several griped about the use of SMA antenna connectors instead of the BNC. We've been told by some manufacturers that SMA connectors are becoming the industry standard, but this current batch still exhibited a mix, and the sentiment among the past two H-T review teams seems to favor the good ol' BNC. Adapters are available, however. Another common theme concerned instruction manuals. While some are well-written and comprehensive, others still seem to do more to confuse users—especially neophytes who lack a firm footing in ham radio vocabulary. Several called for a "quick start" guide to get you up and running, and others criticized manuals that force you to skip around to find needed information.

ALINCO DJ-G5TH

The DJ-G5TH distinguishes itself as a sturdy, capable H-T with several out-of-the-ordinary features. Chief among these is the *channel scope*, a kind of miniature spectrum analyzer that sweeps above and below the designated frequency to give you a visual indication of nearby activity. Users soon found that using the *channel scope* precludes other activities—like programming memory channels. The DJ-G5TH offers an unusual dual-PTT button configuration, too, which was a hit with most users. Press one button and you're transmitting at high power; press the other and you're at low power. The function of the auxiliary PTT can also be changed to implement sub-band or tone-burst transmission.

The receive attenuator is another un-

Alinco DJ-G5TH, serial number T001879

Manufacturer's Specifications	***Measured in ARRL Lab***
Frequency coverage: Receive, left band, 108-174 MHz, FM or AM; right band, 130-174 MHz, FM; both bands, 420-480 MHz, FM. Transmit, 144-148 and 438-450 MHz.	As specified.
Power requirements (per manufacturer): 4.8-13.8 V dc. Receive, ≈85 mA (squelched, both bands); transmit, 1.4 A (max, high power) with standard EBP-36 9.6-V battery pack.	
Size (HWD): 5.5×2.3×1.1 inches; weight: ≈12.2 oz (with EBP-36 battery pack).	
Receiver	*Receiver Dynamic Testing*
FM sensitivity: 12 dB SINAD, left band, VHF, <0.16 μV, right band, UHF, <0.18 μV; left band UHF, right band VHF, <0.25 μV.	For 12 dB SINAD: Left band VHF 0.15 μV, right band UHF 0.15 μV; left band UHF, 0.15 μV; right band VHF, 0.15 μV.
AM sensitivity: Not specified.	120 MHz, 0.36 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 67 dB* 10 MHz offset from 146 MHz, 78 dB 20 kHz offset from 440 MHz, 65 dB* 10 MHz offset from 440 MHz, 90 dB
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 63 dB 20 kHz offset from 440 MHz, 55 dB
IF rejection: Not specified.	VHF, 74 dB; UHF, 96 dB.
Image rejection: Not specified.	VHF, >124 dB; UHF, 66 dB.
Squelch sensitivity: <0.10 μV.	At threshold: VHF, 0.10 μV, UHF, 0.08 μV.
Audio output: 100 mW at 10% THD into 8 Ω, supply voltage not specified.	281 mW at 1.6% THD into 8 Ω with EBP-36 9.6-V battery pack.
Transmitter	*Transmitter Dynamic Testing*
Power output (high): VHF/UHF, ≈4.5 W; with EBP-36 9.6-V battery pack; VHF/UHF, ≈5 W at 13.8 V (external supply), medium and low power levels not specified.	VHF: 5.5 W / 1.2 W / 0.2 W; UHF: 5.4 W / 1.2 W / 0.2 W with EBP-36 9.6-V battery pack. VHF high: 5.9 W, UHF high: 6.5 W at 13.8 V (external supply).
Spurious signal and harmonic suppression: ≥60 dB.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, VHF/UHF, 200 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 105 ms; UHF, 110 ms.

Note: All dynamic range measurements were made at the standard ARRL Lab spacing of 20 kHz.

*Measurement was noise-limited at value shown.

common, yet convenient, feature. You can use it to quickly reduce receiver sensitivity when you're operating in the presence of strong signals (at a hamfest, for example). And speaking of incoming signals, the DJ-G5TH provides an S-meter display—only one of two H-Ts in our review group to have one. One reviewer used it for a little impromptu transmitter hunting!

Band selection on the DJ-G5TH is a breeze. You simply press the L (left) or R (right) buttons to designate the main or sub-bands. You can opt to receive on both bands at once, or mute the sub band. If you prefer monoband operation, a single press of the **MONO** button puts you there. Each band has 80 independent memory channels, plus a call channel and six channels for programmed scans. If you don't mind sacrificing all but one of the 20 autodialer memories, you can increase the number of memories to 100 for each band.With the large VFO knob you can sweep through memory channels or frequencies as you wish. You can enter a frequency directly via the keypad.

Volume and squelch control are press-and-hold button functions rather than traditional knobs. A single set of controls adjusts these levels for whichever band is designated as the main band. When you want to increase the volume, you press and hold the "up" side of the **VOLUME** rocker button. The volume will increase in steps, which appear on the lower portion of the display. **SQUELCH** operates in a similar fashion. Most reviewers felt the DJ-G5TH offered just enough crisp receive audio. It is possible to adjust the volume or squelch level for the sub band without designating it as the main band, but this requires either two hands or an uncommon degree of manual dexterity, since you must press the **F**unction button and the appropriate control button a the same time.

Like most H-Ts, the DJ-G5TH includes various advanced scanning functions. However, its sweep scan is the most remarkable. When you engage this mode, the DJ-G5TH begins sweeping through the band (or memory channels), pausing when it hears a signal. The difference with sweep scanning is that the *channel scope* function is used to create a visual depiction of the signals you've "discovered." This new twist on signal hunting is sure to delight any scanner buff.

The DJ-G5TH transmits CTCSS tones and decodes them, too. The DJ-G5TH has CTCSS tone-coded squelch capability, allowing it to remain silent until the proper subaudible tone is received. When it comes to paging, the real versatility is found in the DJ-G5TH's DTMF tone squelch, otherwise known as *DSQ*. You can set the rig up to respond (unmute) only when it hears "your" particular three-digit DTMF code sequence. This might come in handy for group paging during public service activities.

Other DJ-G5TH features include over-the-air memory cloning (which only works with another DJ-G5TH), a battery-saver function, an automatic shut-down timer, and crossband repeat. The manual describes how to use the DJ-G5TH for 1200-baud packet, but we did not test this function. By the way, most review team members judged the *Instruction Manual* to be complete and well-organized, but one felt that it lacked "common sense" and another—a relative newcomer—found it confusing. Alinco supplements the manual with a wallet-sized *Quick Reference* card and a schematic of the radio.

The DJ-G5TH was the only rechargeable-battery unit in our review group to provide a charging stand as standard equipment. The TH model that we reviewed also has a standard EBP-36N 9.6-V battery. The review team liked the big buttons on this H-T as well, although one reviewer worried that they'd be easier to hit inadvertently.

Our review team was critical of the DJ-G5TH on only a few points. The rig lacks the automatic repeater offset found on many other H-Ts, so, when you change repeater band segments on 2 meters, you have to remember whether the transmit offset is plus or minus. The DJ-5GTH has expanded receive coverage into the aviation band, but you have to select the AM detector manually (the H-T can only receive AM on the left band). This caused confusing moments for some reviewers. Some reviewers found the LCD display was difficult to read at some viewing angles, but most liked the big window it offered. Even smaller symbols were easily visible! Opinions were split on ease of programming; some found it perplexing, but others judged it straightforward.

Overall, if you want a full-featured radio with some novel features, the Alinco DJ-G5TH is worth your attention. With ample output power and receive sensitivity, this H-T held its own in every operating environment we tested.

Manufacturer: Alinco Electronics Inc, 438 Amapola Ave Unit 130, Torrance, CA 90501; tel 310-618-8616; fax 310-618-8758; e-mail **alinco@alinco.com**; **http://www.alinco.com**. Manufacturer's suggested retail price, $429.

ICOM IC-T7A

Unlike many H-Ts you find these days, the ICOM IC-T7A is not stuffed to the hilt with every conceivable feature—and that's one of its major selling points! Not only does this make the IC-T7A one of the more affordable dual-band H-Ts on the market, it also makes it quite easy to use.

When you switch on the IC-T7A, you see a brief battery voltage indication, then it goes directly to the frequency display. You can only view (and use) one band at a time, but no one on our review team considered that to be a major handicap. Changing from VHF to UHF is as simple as pressing the **BAND** button. Once you've selected the band, you can use the VFO knob to zip through the frequencies (or any of its 60 memory channels). You can also enter the frequency directly via the keypad. On VHF, its receive coverage reaches down to 118 MHz, encompassing the aviation band. When you tune through this segment, the AM detector switches in automatically.

Our unit came equipped with the standard BP-180 battery. With this 7.2 V, 600-mAh battery installed, the IC-T7A is supposed to produce 3 W on 2 meters and 1.6 W on 70 cm, but in the ARRL Lab, we measured a bit more than 2.5 W output on VHF (a second unit checked out at 2.8 W) and 2.2 W on UHF. Some reviewers who used this H-T in outlying areas found the UHF power level marginal for repeater operation. Those in urban settings, however, didn't report any problems. (The optional BP-173 9.6-V, 650-mAh battery can provide up to 4 W on VHF and nearly 3 W on UHF.) The IC-T7A seemed easy on the battery, too. One user took the H-T along on a day-long charity walkathon, and it never ran out of steam.

The IC-T7A received many compliments for its ease of operation. As one reviewer commented, "My favorite test is to grab a radio fresh out of the box and measure how long it takes to access my local repeater—without consulting the manual. For the ICOM IC-T7A my watch stopped at 60 seconds!" The radio is simple to program; one extended button push is all it takes to place a frequency and user data in a memory. (The T-7A is programmable via your PC using optional DOS or *Windows* software a vailable from ICOM.) Others liked the light weight and small size of this radio. The *Instruction Manual* covered all the bases—although some users felt it lacked sufficient detail for newbies—and it's backed up by a handy little *Operating Guide* that fits easily into your wallet, shirt pocket, or purse.

There are several interesting features on the IC-T7A that you won't always find on more expensive radios. The automatic power roll-back feature reduces the IC-T7A's output if the PTT has been keyed for more than 6 minutes continuously. This is not only a rig saver, it's a sanity saver for those moments when you accidentally wedge the rig into your car's seat cushions and transmit a continuous unintentional travelogue (we're talking about saving the *listener's* sanity, not yours). The IC-T7A also offers a power saver and an automatic shutoff system. When you place the IC-T7A into the tone scan mode to search for subaudible CTCSS tones, it will not only display the tone frequency, it will automatically store the frequency in tone memory. Last, but not least by a long shot, the IC-T7A automatically selects the proper repeater offset (+ or – the receive frequency) when you tune through the 2-meter band.

Some reviewers did not care for the

ICOM IC-T7A, serial number 02387

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive, 118-174 and 400-470 MHz; transmit, 144-148 and 440-450 MHz.	Receive, AM, 118-136 MHz; FM, 136-174 MHz; UHF, as specified; transmit, VHF, 140-150 MHz; UHF, as specified.
Power requirements (per manufacturer): 4.5-16 V dc. Receive, 150 mA (max, at rated audio output); transmit, 1.3 A (max, at high power), 600 mA (max, low power) at 13.5 V.	
Size (HWD): 5×2.3×1.2 inches; weight: 11.3 oz , with BP-180 battery pack.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity: 12 dB SINAD, VHF/UHF: <0.16 μV; AM not specified.	For 12 dB SINAD: VHF, 0.14 μV; UHF, 0.15 μV.
AM sensitivity: Not specified.	120 MHz, 0.86 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 61 dB 10 MHz offset from 146 MHz, 71 dB 20 kHz offset from 440 MHz, 58 dB 10 MHz offset from 440 MHz, 105 dB
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 65 dB. 20 kHz offset from 440 MHz, 62 dB.
IF rejection: VHF, >60 dB; UHF, >50 dB.	VHF, 85 dB; UHF, 102 dB.
Image rejection: VHF, >60 dB; UHF, >50 dB.	VHF, 85 dB; UHF, 67 dB.
Squelch sensitivity: <0.16 μV.	At threshold: AT squelch, VHF/UHF, 0.13 μV; squelch, VHF/UHF, 0.20 μV.
Audio output: >250 mW at 10% THD into 8 Ω, with 13.5-V external supply.	259 mW at 10% THD into 8 Ω with BP-180 7.2-V battery pack;
Transmitter	*Transmitter Dynamic Testing*
Power output (H/L): VHF, 4W / 0.5 W, UHF, 3 W / 0.5 W, with 13.5-V external supply.	VHF, 2.5 W / 0.6 W; UHF, 2.2 / 0.5 W with standard BP-180 7.2-V battery battery pack. VHF high, 4.9 W, UHF high, 3.5 W at 13.5 V (external supply).
Spurious signal and harmonic suppression: Not specified.	VHF/UHF, <60 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, VHF/UHF, 110 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 92 ms; UHF, 115 ms.

Note: All dynamic range measurements were made at the standard ARRL Lab spacing of 20 kHz.

squelch implementation. In fact, there is no squelch control *per se*. You have the option to choose from among four squelch modes: "automatic" (based on a noise-pulse-counting scheme), "1" (tight), "2" (tighter), or "open." Of course, this means one less control to worry about. We found the "automatic" squelch setting worked just fine.

The bottom line is that the IC-T7A is a versatile H-T that won't break your budget or your patience. Simplicity can be a virtue!

Manufacturer: ICOM America Inc, 2380 116th Ave NE, Bellevue WA 98004; tel 425-454-8155; fax 425-454-1509; **http://www.icomamerica.com**. Manufacturer's suggested retail price: $359

ICOM IC-W32A

With the IC-W32A ICOM attempts to address the problem of confusing over-complexity. Difficult as it may be to believe, the IC-W32A does not have the dreaded **FUNCTION** key. Instead, the rig's features are controlled through a combination of keypad buttons and/or the VFO knob. If you're ever in doubt about a button's function and don't have the manual at hand, a built-in "guide" (consisting of "crawl text") will lead the way. Just press and hold the **L/G** button (immediately beneath the PTT switch) and then press the "mystery" button in question. You'll be greeted with a brief text explanation that crawls along the bottom of the LCD display! This is the kind of noteworthy feature normally reserved for mobile radios, so users were pleased to discover it on the IC-W32A.

The IC-W32A offers 100 memories per band, plus five pairs of scan-edge channels and one call channel per band. Along with the usual frequency, tone and offset information, you can include an eight-character alphanumeric label for each channel. This is extremely convenient when you're flipping through memory channels and need to have your own memory refreshed! (Hmmm . . . which repeater did I program this channel for?) The IC-W32A's DTMF autodialer also has four independent memories for your most-often-called telephone numbers.

The IC-W32A includes a CTCSS decoder as standard equipment. It functions as a tone squelch, keeping the radio silent until someone sends the correct subaudible tone. Alternatively, you can set the rig to beep continuously when a tone is received and decoded. The IC-W32A can also scan for CTCSS tones in use. When the tone scan is active, the IC-W32A will monitor the channel for any CTCSS tones and display their frequencies. As with its smaller sibling, the IC-T7A, you choose from among four squelch modes that include an "automatic" setting, two preset squelch levels ("1" or "2") or "open."

Other conspicuous features include a cloning function, which allows you to swap memory contents with another IC-W32A (an optional cloning cable is required). You can also program the IC-W32A with your PC using optional ICOM software for *Windows* or DOS. A battery-saver function and automatic shutdown (programmable) enhances the rig's usefulness during long public service operations. And, of course, the IC-W32A offers simultaneous dual-band receive, extended receive capability and crossband duplex (either semi or full).

Our reviewers gave the IC-W32A high marks overall. At about 1 lb, it was the heaviest H-T of the group, but that's in part due to its large battery. The IC-W32A has a maximum rated output of 5 W with the

supplied battery, the BP-173 (which also can power the IC-T7A). The BP-173 supplies 9.6 V and is rated at 650 mAh.

Some reviewers praised the radio for innovative functions such as LCD contrast control (more than just a backlight dimmer), versatile scan modes, battery voltage indicator and the ability to perform a partial reset without erasing the memory contents. Speaking of memory, the IC-W32A comes with 10 NOAA weather-broadcast frequencies preprogrammed. Nice!

The review team faulted the IC-W32A on two points. They reported that the dual **VOLUME** controls—mounted concentrically with the VFO knobs—were awkward and prone to easy accidental misadjustment. However, it's easy to swap these so that the one you use most often is on the side away from the antenna where it's much easier to reach. A few reviewers criticized the *Instruction Manual*. For example, one noted that it tells users exactly how to set a CTCSS tone encoder frequency, but omits the crucial step of turning the encoder on! To accomplish that task you have to look elsewhere in the manual. Like the IC-T7A manual, the IC-W32A's manual is backed up by a little fits-almost-anywhere *Operating Guide.*

With its five big watts and a plethora of features, the IC-W32A provides just about everything you could possibly need in an H-T. Best of all, perhaps, the IC-W32A makes a serious effort to take some of the pain out of using a small, complex piece of technology.

Manufacturer: ICOM America Inc, 2380 116th Ave NE, Bellevue WA 98004; tel 425-454-8155; fax 425-454-1509; **http://www.icomamerica.com**. Manufacturer's suggested retail price: $479

Standard C508A

Of all the transceivers tested for this review, the C508A is the smallest. The word "tiny" barely does justice to the size of this radio. At about $2^{1}/_{4}$ inches wide and just under 4 inches high (not including antenna), the C508A can fit into your shirt pocket with room to spare. Because of its diminutive design, some describe the C508A as looking like a child's toy. Don't be deceived, though. The C508A is packed with serious features.

Receive coverage is outstanding: from 100 to around 952 MHz (cellular telephone frequencies blocked)—quite a lot of spectrum for a such a tiny radio. In the 902-MHz ham band, it has respectable sensitivity, but ARRL Lab measurements revealed that the image signal is actually stronger than the fundamental (see table). But this additional coverage is basically a "gimme," so no one's complaining.

When the C508A is receiving between 108 and 142 MHz, it automatically switches to the AM mode, although this feature can be disabled. You change frequencies by spinning the VFO knob. Spin it faster and it changes frequency faster. If you really need to get from one end of the band to another in a hurry, hold the **F**unction button and you'll be jumping in 1-MHz steps for every click of the knob. You can jump from band to band courtesy of a front panel **BAND** button. Like the IC-T7A, you can't listen to UHF and VHF at the same time, although the C508A will let you do crossband split (more on that later). You step through the bands one at a time. The default starting frequencies for each band are 146, 350, 446 and 850 MHz.

The **VOLUME** control is side mounted and easy to use. A flick of the thumb is all it takes. There is no squelch control on

ICOM IC-W32A, serial number 01414

Manufacturer's Specifications	***Measured in ARRL Lab***
Frequency coverage: Receive, 118-174 and 400-470 MHz; transmit, 144-148 and 440-450 MHz.	Receive, AM, 118-136 MHz; FM, 136-174 MHz; UHF, 435-455 MHz; transmit, VHF, 140-150 MHz; UHF, as specified.
Power requirements (per manufacturer): 4.5-16 V dc. Receive, 210 mA (at rated audio output); transmit, 1.6 A (max, at high power), 600 mA (max, at low power) at 13.5 V.	
Size (HWD): 5.6×2.3×1.3 inches; weight: 16 oz, with BP-173 battery pack.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity: 12 dB SINAD, VHF/UHF default, <0.16 μV; VHF/UHF opposite, <0.32 μV.	For 12 dB SINAD: 146 MHz default 0.13 μV; UHF default, 0.15 μV; VHF opposite, 0.16 μV; UHF opposite, 0.15 μV.
AM sensitivity: Not specified.	120 MHz, 0.56 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 57 dB 10 MHz offset from 146 MHz, 70 dB 20 kHz offset from 440 MHz, 58 dB 10 MHz offset from 440 MHz, 91 dB
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 64 dB. 20 kHz offset from 440 MHz, 62 dB.
IF rejection: Not specified.	VHF, 83 dB; UHF, 76 dB.
Image rejection: Not specified.	VHF, 82 dB; UHF, 60 dB.
Squelch sensitivity: <0.16 μV.	At threshold: AT squelch, VHF, 0.12 μV, UHF, 0.13 μV; squelch, VHF 0.20 μV, UHF, 0.16 μV.
Audio output: >180 mW at 10% THD into 8 Ω, supply voltage not specified.	218 mW at 10 % THD into 8 Ω with standard BP-173 9.6-V battery pack;
Transmitter	*Transmitter Dynamic Testing*
Power output (H / L): VHF/UHF: 5 W / 0.5 W at 13.5-V.	VHF, 5.5 W / 0.5 W; UHF, 5.1 W / 0.7 W with BP-173 9.6-V battery pack; VHF high, 5.6 W; UHF high, 5.4 W at 13.5 V (external supply).
Spurious signal and harmonic suppression: Not specified.	VHF/UHF: ≥60 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, VHF, 118 ms, UHF, 110 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 88 ms; UHF, 92 ms.

Note: All dynamic range measurements were made at the standard ARRL Lab spacing of 20 kHz.

the C508A. Instead, there is an RF-level squelch, which is adjustable through the radio's menu system. If you need to listen to the frequency unsquelched, however, all you have to do is press the **MONI** button.

The C508A offers 60 memory channels for 2 meters and 70 cm. Programming memory is relatively simple, and some users called the C508A the easiest radio of the bunch to program—in part because it has so few controls to get you lost or confused. You can also scan through the memory banks. In fact, when it comes to scanning, the C508A provides no fewer than seven different scanning methods.

Two AA cells power the C508A. You can also opt to use rechargeables, although our reviewers reported excellent results with single-use alkalines. The radio only draws about 35 mA when receiving and up to 280 mA when transmitting. The battery save function extends battery life by placing the H-T in a low-current "sleep" mode, then periodically switching it back on to check for activity. There is also the automatic power shutdown mode, which turns the C508A off completely if there is no activity during a 30-, 60- or 120-minute period (you get an audible warning one minute before shutdown occurs). The C508A has some menu shortcuts. The *my key* function lets you assign an often used function to come up (when you press the **F**unction and **SET** buttons simultaneously). Another lets you assign two selected menu items to come up first (when you press **F** plus **CALL** at the same time), so you won't have to scroll through all of the choices. The C508A gives you the option of displaying memories by number instead of frequency, too.

The C508A is rated at only 280 mW output—little more than a quarter of a watt. Despite such a low power level (and, perhaps more important, a less-than-optimum rubber duckie antenna), our reviewers received good signal reports on 2 meters when they used the C508A with *local* repeaters. The key word here is *local*, however. If you have a clear shot at a repeater, then the C508A will do just fine. Signal reports on 70 cm were not quite so generous, but not bad considering the power. Several reviewers also remarked that the C508A was an excellent rig for simplex use at hamfests, around the house, and other applications where only local coverage is necessary. Most found it a real companion for just listening. A more efficient antenna likely would extend its transmitting range significantly.

The *Owner's Manual* underplays one potentially convenient application of this little H-T. If your higher-power mobile radio can operate in crossband split (repeater) mode, simply use your C508A in split memory (dup) mode to transmit through your mobile on one band while receiving the repeater's output directly! (Remember, FCC regulations require that you identify your "repeater" as well as yourself in such instances, and you should use a vacant frequency in the repeater subband.) If you have tone squelch on your mobile radio, you can set this on the C508A to restrict other stations from your input frequency, too.

Our review team lamented the lack of an automatic repeater offset function, which was sorely missed on 2 meters. If you switch from the high to low end of the repeater subband, you have to flip-flop the transmit offset yourself—and most users found the tiny + or – and other top-line legends on the display difficult to decipher. Second, the C508A lacks a DTMF keypad, so you're not going to be able to use this rig to access a repeater's telephone autopatch.

Standard C508A, serial number 40087

Manufacturer's Specifications	***Measured in ARRL Lab***
Frequency coverage: Receive and transmit, 144-148 and 438-450 MHz.	Receive, ≈100-188; ≈335 to 400; ≈400-487 and ≈700-952 MHz (cellular blocked); transmit, as specified.
Power requirements (per manufacturer): 2.2-3.5 V (3.0 V nominal). Receive, ≈36 mA (squelched); transmit, ≈280 mA.	
Size (HWD): ≈3.8×2.6×1.2 inches; weight: 5.6 oz (including batteries).	
Receiver	*Receiver Dynamic Testing*
FM sensitivity: 12 dB SINAD, 144-148 MHz, <0.2 μV; 438-450 MHz, <0.22 μV; other bands not specified.	For 12 dB SINAD: 146 MHz, 0.14 μV; 440 MHz, 0.17 μV; 350 MHz, 0.40 μV; 902 MHz, 0.66 μV.
AM sensitivity: Not specified.	120 MHz, 0.29 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 51 dB 10 MHz offset from 146 MHz, 68 dB 20 kHz offset from 440 MHz, 55 dB* 10 MHz offset from 440 MHz, 105 dB
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 59 dB. 20 kHz offset from 440 MHz, 55 dB.
IF rejection: Not specified.	VHF, 96 dB; UHF, 114 dB; 902 MHz, 41 dB.
Image rejection: Not specified.	VHF, 73 dB; UHF, 46 dB; 902 MHz, –7 dB (see text).
Squelch sensitivity: <0.2 μV.	At threshold: VHF, 0.12 μV, UHF, 0.16 μV.
Audio output: 100 mW at 10% THD into 8 Ω, supply voltage not specified.	99 mW, with AA alkaline cells.
Transmitter	*Transmitter Dynamic Testing*
Power output: 280 mW.	VHF, 275 mW; UHF, 270 mW, with AA alkaline cells.
Spurious signal and harmonic suppression: ≥40 dB.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, VHF/UHF, 140 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 85 ms; UHF, 90 ms.

Note: All dynamic range measurements were made at the standard ARRL Lab spacing of 20 kHz.
*Measurement was noise-limited at value shown.

And, finally, the C508A *Owner's Manual* suffers from a rocky translation into English, which can make learning to use the radio a bit more difficult or confusing than it should be. While the manual contains all the needed information (plus a block diagram of the radio), some of its descriptions tended to obscure the real value of certain features, so users might overlook them.

But these are minor criticisms of what is otherwise a fine little rig. If you only work strong, local repeaters and you want a radio that's smaller than your wallet—and just as convenient—consider the C508A.

Manufacturer: Standard Amateur Radio Products Inc, Box 48480, Niles, IL 60714; tel 773-763-0081; fax 773-763-3377; **http://www.stdradio.com**. Manufacturer's suggested retail price, $345.

Yaesu FT-50R

The size of this H-T approaches that of the Standard C508A, but the Yaesu engineers have managed to squeeze an amazing number of features into its diminutive package. With its clam shell battery pack attached, the FT-50R is a dense little radio, too. It feels like holding a chunk of granite in your palm. And, like the aforementioned rock, the FT-50R is extremely rugged and water resistant (Yaesu advertisements for the FT-50R often show it sopping wet and brag that it's the first dual-band H-T to achieve a MIL-STD 810 rating). According to the manual, the FT-50R can even survive complete submersion—as long as you allow it to dry completely before turning it on (Yaesu doesn't say if this works if you drop the H-T in *salt* water). Our review unit had the FNB-41 "high-power" battery (9.6 V, 600 mAh), which produces up to 5 W on 2 meters or 70 cm.

The FT-50R offers two independent VFOs and up to 100 memory channels for your convenience. As you tune through its extensive frequency range (76 to 999 MHz in various band segments), the "main" and "sub" band digits can be displayed simultaneously (the main-band digits are shown 50% larger than the sub-band numerals to avoid confusion), and, of course, you can listen to both VHF and UHF at the same time. Notice that the FT-50R can tune through the FM broadcast band. Yes, this means that you can listen to your favorite FM stations with the FT-50R, although even in the wideband mode the audio is somewhat distorted. You can also monitor AM aviation transmissions from 108 through 137 MHz. ARRL Lab tests revealed the image rejection in the 902-MHz ham band was slightly in the negative numbers, however (see table). This means that the image signal will be a bit stronger than the desired signal in this region of the spectrum.

The **VFO** and **VOLUME** controls are concentric, which can take a little getting used to. Like many other modern H-Ts, the FT-50R does not have an independent squelch knob. Instead, you must set the squelch threshold through the menu system (you select from 15 different sensitivity levels). Of course, you can punch the **MON** button to disable the squelch altogether when you want to check activity on a particular frequency. Our review team liked the ample (up to 0.5 W) receive audio from the FT-50R.

Yaesu FT-50R, serial number 61080928

Manufacturer's Specifications	***Measured in ARRL Lab***
Frequency coverage: Receive, 76-200, 300-400, 400-540, and 590-999 MHz (cellular blocked); transmit, 144-148 and 430-450 MHz.	Receive and transmit, as specified.
Power requirements (per manufacturer): 4-16 V dc. Receive, ≈55 mA (squelched); transmit, 1.6 A (max) with FNB-40 0 V battery pack.	
Size (HWD): 4×2.4×1.3 inches; weight: 12.5 oz with FNB 41 battery pack, antenna and belt clip.	
Receiver	*Receiver Dynamic Testing*
FM sensitivity: 12 dB SINAD, VHF, 0.16 µV; UHF, 0.18 µV.	For 12 dB SINAD: VHF, 0.14 µV; UHF, 0.15 µV; 350 MHz, 0.27 µV; 902 MHz, 0.52 µV; WFM, 98 MHz, 0.47 µV.
AM sensitivity: Not specified.	120 MHz, 0.43 µV.
Two-tone, third-order IMD dynamic range: 65 dB at 100-kHz offset.	20 kHz offset from 146 MHz, 55 dB 10 MHz offset from 146 MHz, 75 dB 20 kHz offset from 440 MHz, 54 dB 10 MHz offset from 440 MHz, 90 dB
Adjacent-channel rejection: 65 dB at 25-kHz offset.	20 kHz offset from 146 MHz, 51 dB. 20 kHz offset from 440 MHz, 51 dB.
IF rejection: Not specified.	VHF, 90 dB; UHF, 120 dB; 902 MHz, 71 dB
Image rejection: Not specified.	VHF, 82 dB; UHF, 50 dB; 902 MHz, –3 dB (see text).
Squelch sensitivity: Not specified.	At threshold: VHF, 0.11 µV; UHF, 0.06 µV
Audio output: 0.5 W at 10% THD into 8 Ω, supply voltage not specified.	530 mW at 10% THD into 8 Ω with FNB-41 9.6-V battery pack.
Transmitter	*Transmitter Dynamic Testing*
Power output (H / M / L / LL): VHF/UHF, 5 W / 2.8 W / 1 W / 0.1 W at 9.6 V.	VHF, 5.1 W / 2.7 W / 1 W / 0.1 W; UHF, 5.0 W / 2.6 W / 0.9 W / 0.1 W, with FNB-41 9.6-V battery pack. VHF high, 5.1 W; UHF high-5.0 W at 9.6 V (external supply).
Spurious signal and harmonic suppression: >60 dB.	As specified. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch off, S9 signal, VHF, 65 ms; UHF, 65 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 7 ms; UHF, 12 ms.

Note: All dynamic range measurements were made at the standard ARRL Lab spacing of 20 kHz.

Our FT-50R—which had the FTT-11 16-button pad—came equipped with CTCSS and DTMF encoders plus the handy DTMF autodialer. Because of customer demand, Yaesu now only sells the FT-50RD. The FT-50RD includes the FTT-12 keypad and is capable of decoding CTCSS and DTMF tones for sophisticated scanning and paging functions. Better than that, it also provides a digital voice recorder that can store up to 20 seconds of messages (it can manually or automatically record received signals too) and even has digital voice mail capability!

As we mentioned earlier, every H-T offers at least one particularly clever feature. In the case of the FT-50R, it is *ARTS*, *A*uto *R*ange *T*ranspond *S*ystem, which we discussed when we reviewed the nearly identical looking FT-10R (see "Product Review," *QST*, May 1996). Putting it simply, ARTS uses brief tone transmissions—one every 15 seconds—to seek out any other FT-50R users who might be in range (presumably, this will work with other ARTS-equipped Yaesu transceivers as well). If it receives a response, it alerts both users with a series of beeps. When it's in the ARTS mode, the FT-50R can be set to identify itself in Morse code every 9 minutes to meet FCC station identification requirements.

But ARTS isn't the only handy feature you'll discover in the FT-50R. There is a *TX Save* mode that automatically reduces your output power when the received signal strength exceeds a preset level (why waste your batteries unnecessarily?). You can also conserve energy through several battery saver modes. Even the LCD display can be set to operate for only brief intervals, if you desire.

For a degree of communication privacy that goes beyond the typical CTCSS or DTMF tone squelch systems, the FT-50R also offers Digital Coded Squelch (DCS), a tone squelch protocol popular on commercial radios and, Yaesu says, a hit with many H-T customers.

The FT-50R is one of only two H-Ts in this review to include a signal-strength meter. This is convenient when you're trying to find the best location to hit a distant repeater. It's also the only other H-T in our group to include memory naming as a standard feature. The FT-50R lets you apply four-character alphanumeric names to memory channels. Visually impaired hams will appreciate the FT-50R's extensive use of distinct audio tones to signal when keypad buttons are depressed. This is a plus because some users found the FT-50R's display difficult to see—especially the information on the top line. A few reviewers found the display hard to read at certain angles.

A cloning function—which requires a simple connection between two radios—allows you to swap memory contents with another FT-50R. In addition, you can use the optional *ADMS-1C* software to program the radio via your PC. And if you ever become bored with talking or listening, you can play the built-in "Perfect 10 Challenge Game" on your FT-50R! (As Dave Barry might say, "I'm not making this up.") The FT-50R also can be set up to track a repeater input frequency along with the output as you tune.

With so many features squeezed into a small space, programming can be a chore. That's the one fault everyone on the review team noted about the FT-50R. Even with its above-average manual and the handy *Quick Code Sheet*, this is a tricky radio to set up and use (the *Quick Code Sheet* also contained an error in describing how to save a frequency to memory). No one was able to get the FT-50R working out of the box without resorting to the manual. Even then, some operations, such as enabling the CTCSS encoder, were still perplexing. The experience of this review team tended to mirror that of FT-10R users. As the manual points out, the trick is to make sure you press the keypad buttons only for the required duration. Doing otherwise can yield unexpected results.

Others mentioned problems with the ergonomics of the FT-50R. Unless you have very long fingers, it is difficult to press the PTT button while holding the H-T in your right hand. Yaesu included an erratum with the instruction book emphasizing that the PTT switch "should be pressed inward and in a slightly downward direction." A left-handed grip, using the thumb to actuate the PTT, works much better, but may be awkward for some users.

Overall, the FT-50R is an extraordinarily rugged radio with an incredible array of features, especially when you consider its pint-size package.

Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703; tel 562-404-2700; fax 562-404-1210; **http://www.yaesu.com/**. Manufacturer's suggested retail price, $380 for FT-50RDHP model, which includes the FTT-12 keypad and the FNB-41 high-power battery.

Conclusion

As with any product review—and especially a comparison review like this one—take time to check the ARRL Lab tables for each H-T as well as the features table. This information can prove invaluable in making a buying decision. One of these H-Ts could be just the one you've been looking for.

Our thanks to the review team and to Mike Gruber, W1DG; Mike Tracy, KC1SX; and Ed Hare, W1RFI; of the ARRL Lab for their contributions to this product review.

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